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10/608,083	06/27/2003	Nicolas Bruno	302692.01	8078

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EXAMINER
CHANNAVAJJALA, SRIRAMA T

ART UNIT	PAPER NUMBER
2166	

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Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/608,083	BRUNO ET AL.
	Examiner	Art Unit	
	Srirama Channavajjala	2166	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>*27 June 2003*</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-61* is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All   b)☐ Some * c)☐ None of:

   1.☐ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
   Paper No(s)/Mail Date <u>8/29/03</u>.

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

DETAILED ACTION

1.   Claims 1-61 are presented for examination.

Drawings

2.   The Drawings filed on 6/27/2003 are <u>acceptable</u> for examination purpose.

Information Disclosure Statement

3.   The information disclosure statement filed on 8/29/2003 is in compliance with the

provisions of 37 CFR 1.97, and has been considered and a copy is enclosed with this

Office Action.

Claim Rejections - 35 USC § 112

4.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

5.   Claims 1,23,45-46,54-55 are rejected under 35 USC 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention.

6.   As to claims 1,23,45, step [d], it is not clearly what is meant by "recursively

performing steps b)-f) to determine a selectivity value for each query selectivity factor,

as step f) limitation[s] does not include to performing recursively performing steps,

7.   As to claim 46, 54,it is not clear what is meant by steps b)-f) in the step d) as <u>step</u>

<u>f)</u> is missing.

8.   At page 53, claim 55 is dependent on claim 55 itself; examiner assumes claim 55

is dependent on independent claim 54, and it is treated as claim dependent on claim 54

in the office action.

Appropriate correction required.

Double Patenting

9.   The nonstatutory double patenting rejection is based on a judicially created

doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the

unjustified or improper timewise extension of the "right to exclude" granted by a patent

and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11

F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225

USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA

1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*,

418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be
used to overcome an actual or provisional rejection based on a nonstatutory double
patenting ground provided the conflicting application or patent is shown to be commonly
owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A
terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10.   Claims 1-61 are provisionally rejected under the judicially created doctrine of

obviousness-type double patenting as being unpatentable over claims 1-23 of

US Patent No. *6,947,927*. Although the conflicting claims are not identical, they are not

patentably distinct from each other because in the present application Independent

Claims 1,23,45-46,54 are directed to "A method for approximating a number of tuples

returned by a database query that comprises a set of predicates that each reference a

set of database tables, the method comprising the steps of: a) expressing the query as

a query selectivity; b) determining if the query is separable and if so separating the

query selectivity to form a product of query selectivity factors; c) if the query is not

separable,.....d) recursively performing steps.....e) matching any conditional selectivity

expression with....f) combining the selectivity values obtained in step d)....while US

Patent No. *6,947,927*, independent Claims 1,10,14,19, are directed to "In a relational

database having records stored therein and having a query optimizer that generates a

query execution plan wherein each query plan comprises a plurality of intermediate

query plan components that verify a subset of records from the database meeting query

criteria, a method for evaluating a user query comprising the steps of: accessing the

query plan and set of stored intermediate statistics for records verified by query

components of the query plan, selecting intermediate statistics and applying them to the

query plan...estimating the cardinality of the transformed query plan.

Present application:10/608,083	*US Patent No. 6,947,927*
Claim 1,23,45-46,54	Claim 1,10,14,19
Claims 2	Claim 2,
Claims 22	Claim 3
Claims 12,47,55	Claim 7

It would have been obvious to one of the ordinary skill in the art at the time of the

applicant's invention to add or drop limitation, specifically "accessing the query plan,

selecting intermediate statistics, and estimating the cardinality of the transformed query

plan [US Pat. *6,947,927*], because both applicants are specifically directed to query

optimization with respect to statistics, also the subject matter claimed in the instant

application is fully disclosed in the referenced US Patent No. *6,947,927,* since omission

and addition of the limitation[s] would have not changed the query optimization process

according to which the process of accessing the query plan. Therefore, the ordinary

skilled artisan would have been also motivated to modify claim 1,23,45-46,54 of the

instant application [add or omit elements] would not interfere with the functionality of the

steps previously claimed and would perform the same function. In re Karlson, 136

USPQ 184 (CCPA 1963). The dependent claims 2- 22,24-44,47-53,56-61 are also

rejected in the analysis above. Accordingly, the instant Claims of the present

application are within the scope of the Claims 1-23 of US *Patent No. 6,947,927.*

This is a provisional obviousness-type double patenting rejection because the

conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

11.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12.   ***Claims 1-18, 22-40, 44-61 are rejected under 35 U.S.C. 102(b) as being***

anticipated by Nicolas Bruno [hereafter Bruno] "Automatic management of

statistics on Query expressions in relational database", Ph.D Thesis Proposal,

department of computer science, Columbia University, NY, published on April 25,

2002.

13.   As to claim 1, 23,45, Bruno teaches a system which including 'approximating a

number of tuples returned by a database query that comprises a set of predicates that

each reference a set of database tables' [page 1, line 4-7], Bruno discusses query

optimizers specifically using base tables having attributes, tuple[s] are integral part of

any relational base tables because each row of the table represents at least one tuple ,

cardinality is the number of tuples in a relation, and search condition corresponds to

predicate [page 1, line 12-13], page 4, fig 2.2];

        '(a)expressing the query as a query selectivity' [page 4, example 1, fig 2.2 a-b],

Bruno suggests query optimizer for example as detailed in fig 2.2, specifically directed

to query selectivity using relational operators in the query optimizer as detailed in

fig 2.2;

' (b) determining if the query is separable and if so separating the query

selectivity to form a product of query selectivity factors' [page 5, 2.2.1, example 2,

page 6, line 1-3], Bruno specifically teaches selection queries having multiple predicates

for example as detailed inn page 5, "SELECT * FROM R

WHERE R.a > 10 AND R..b < 100

Where the selectivity for the whole predicate is estimated as detailed in page 6,

line 1-2;

'(c) if the query is not separable, decomposing the query selectivity to form a

product that comprises a conditional selectivity expression' page 9, 3.2.2, fig 3.1], Bruno

specifically teaches various predicates for example equality join, conjunctive [see fig

3.1b], join predicates, further for a given query, the decomposing query into possible

sub queries;

'(d) recursively performing steps b)-f) to determine a selectivity value for each

query selectivity factor' [page 5, line 10-14, page 6, 2.2.2 , fig 2.4];

'(e) matching any conditional selectivity expression with stored statistics to obtain

statistics that can estimate the selectivity of the conditional selectivity expressions and

using the statistics to obtain an estimated selectivity value' [page 6, 2.2.2, line 12-22,

fig 2.4, page 14, example 4, fig 4.1];

'(f) combining the selectivity values obtained in step (d) and the estimated

selectivity values obtained in step (e) to estimate the selectivity of the query' [page 15,

line 6-18, fig 4.1-4.2].

14.   As to claim 46, 54, Bruno teaches a system which including 'approximating a

number of tuples returned by a database query that comprises a set of predicates that

each reference a set of database tables' [page 1, line 4-7], Bruno discusses query

optimizers specifically using base tables having attributes, tuple[s] are integral part of

any relational base tables because each row of the table represents at least one tuple ,

cardinality is the number of tuples in a relation, and search condition corresponds to

predicate [page 1, line 12-13], page 4, fig 2.2];   .

        '(a)expressing the query as a query selectivity' [page 4, example 1, fig 2.2 a-b],

Bruno suggests query optimizer for example as detailed in fig 2.2, specifically directed

to query selectivity using relational operators in the query optimizer as detailed in

fig 2.2;

        ' (b) determining if the query is separable and if so separating the query

selectivity by separating the predicates that reference different sets of database tables

to form a product of query selectivity factors that reference different sets of database

tables' [page 5, 2.2.1, example 2,   page 6, line 1-3], Bruno specifically teaches

selection queries having multiple predicates for example as detailed inn page 5,

"SELECT * FROM R

        WHERE R.a > 10 AND R..b < 100

Where the selectivity for the whole predicate is estimated as detailed in page 6,

line 1-2;, database tables corresponds to Bruno's base tables,

        '(c) if the query is not separable, repeatedly decomposing the query selectivity to

form a product that comprises a conditional selectivity expression to generate

alternative products and wherein one of those products is selected to estimate the selectivity of the query' [page 9, 3.2.2, fig 3.1], Bruno specifically teaches various predicates for example equality join, conjunctive [see fig 3.1b], join predicates, further for a given query, the decomposing query into possible sub queries;

'(d) recursively performing steps b)-f) to determine a selectivity value for each query selectivity factor' [page 5, line 10-14, page 6, 2.2.2 , fig 2.4];

'(e) matching any conditional selectivity expression with stored statistics to obtain statistics that can estimate the selectivity of the conditional selectivity expressions [page 6, 2.2.2, line 12-22, fig 2.4, page 14, example 4, fig 4.1];

i) 'compiling a set of candidate statistics that can be used to estimate the selectivity of the conditional selectivity expression' [page 12, 3.3, line 1-13], conditional selectivity expression corresponds to SQL query as given in line 9-13];

ii) 'selecting candidate statistics to estimate the selectivity of the conditional selectivity expression based on a selection criteria' [page 12, line 9-13]

iii) 'using the statistics to obtain an estimated selectivity value'[page 12, line 14-15]

15.   As to claim 2,24, Bruno disclosed 'multiplying the estimated selectivity by a

Cartesian product of the tables referenced by the predicates to obtain a cardinality of

the query' [page 4, fig 2.2], Cartesian product corresponds to joining two tables for

example see SQL statement in fig 2.2 [a].

16.   As to claim 3,25, Bruno disclosed 'separating the query selectivity is performed

by separating the predicates that reference different sets of database tables to form a

product of query selectivity factors that reference different sets of database tables'

[page 5, 2.2.1, page 6, 2.2.3, see SQL statement particularly directed to selection

queries having multiple predicates on different attributes of the table;

17.   As to claim 4-5,26-27, 50-51, 58-59, Bruno disclosed 'step c) further comprises a

query selectivity factor and wherein steps b)-f) are recursively performed to determine a

selectivity value for the query selectivity factor in step c) [page 5, line 10-14, page 6,

2.2.2 , fig 2.4];

18.   As to claim 6,28, Bruno disclosed 'storing the estimated selectivity of the query

obtained in step f) in memory' [page 7, line 5-11].

19.   As to claim 7, 29, Bruno disclosed 'estimated selectivity is stored for a query and

returning that value to approximate the number of tuples returned by the query' [page 7,

line 14-17].

20.   As to claim 8, 30, 52, 60, Bruno disclosed 'error with the estimated selectivity

value that is based on an accuracy with which the statistic matched with the conditional

selectivity expression can estimate the selectivity of the conditional selectivity

expression' [page 8, line 1-4, page 9, 3.2].

21.   As to claim 9, 31, 53, 61, Bruno disclosed 'error associated with each conditional

selectivity expression to obtain an estimated error for the selectivity estimation for the

query' [page 9, 3.3.2, line 1-7].

22.   As to claim 10, 32, Bruno disclosed 'statistics comprise histograms on results of

previously executed query expression' [page 5, fig 2.3, 2.2.1].

23.   As to claim 11, 33, Bruno disclosed 'matching the conditional selectivity

expressions with stored statistics is performed by compiling a set of candidate statistics

that can be used to estimate the selectivity of the conditional selectivity expression'

[page 12, 3.3, line 1-13], conditional selectivity expression corresponds to SQL query as

given in line 9-13]; 'selecting candidate statistics to estimate the selectivity of the

conditional selectivity expression based on a selection criteria' [page 12, line 9-13]

24.   As to claim 12,34, 47, 55, Bruno disclosed 'selection criteria for a candidate

statistic is determined by computing a number of independent assumptions that are

made when the candidate is used to estimate the selectivity of the conditional selectivity

expression and the selection criteria is to select the candidate that results in the least

number of independence assumptions' [page 10, line 1-16, example 3].

25.   As to claim 13,35, 48, 56, Bruno disclosed 'selection criteria for a candidate

statistic is determined by comparing the candidate statistic with a base statistic over the

same column as the candidate statistic and assigning a difference value to the

candidate statistic based on a level of difference between the candidate statistic and the

base statistic' [page 13, 4.1, line 1-9,page 14, line 7-13].

26.   As to claim 14,36, 49, 57, Bruno disclosed 'compiling a set of candidate statistics

is performed by including statistics that are on results of queries having the same tables

referenced by the conditional selectivity expression or a subset of the tables referenced

by conditional selectivity expression [page 13, 4.2, line 1-6], 'the same predicates over

the tables referenced in the conditional selectivity expression or a subset of the

predicates over the tables referenced in the conditional selectivity expressions'

[page 14, 4.2, line 7-17].

27.   As to claim 15,37, Bruno disclosed 'decomposing the query selectivity and

matching the conditional selectivity expressions are repeated to generate alternative

products and wherein one of those products is selected to estimate the selectivity of the

query' [page 15, line 14-16,page 16, line 5-10].

28.   As to claim 16,38, Bruno disclosed 'decomposing the query is done by

exhausting every alternative way of decomposing the query [page 16, line 4-10]

29.   As to claim 17,39, Bruno disclosed 'decomposing the query selectivity to form

products of conditional selectivity expressions is performed based on an optimizer

search strategy' [page 16, line 11-19].

30.   As to claim 18,40, Bruno disclosed 'query is disjunctive and comprising the step

of transforming the disjunctive predicates into conjunctive predicates by performing a

De Morgan transformation on the disjunctive query' [page 4, fig 2.2, example 1], fig 2.2

a-b represent nodes connected with the same operator for example either conjunction

[equivalent to AND operator] or disjunction [equivalent to OR operator] , further De

Morgan's law supports inverts logical comparison operators for example reversing

logical AND or OR operators where necessary and common knowledge in relational

database art.

31.   As to claim 22,44, Bruno disclosed 'statistics comprise histograms built over

computed columns in a query result' [page 5, 2.2.1, fig 2.3].

Claim Rejections - 35 USC § 103

32.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

33.   **Claims 19-21,41-43 are rejected under 35 U.S.C. 103(a) as being**

unpatentable over *Nicolas Bruno [hereafter Bruno] "Automatic management of*

statistics on Query expressions in relational database", Ph.D Thesis Proposal,

***department of computer science, Columbia University, NY,* published on April 25,**

2002 *as applied above 1,23 claims further in* view of Acharya et al. [hereafter

Acharya], US Patent No. 6477534 filed on Jan 11,2000, published on Nov 5,2002.

34.   As to claim 19,41, Bruno does not specifically disclosed 'query comprises a

GROUP BY predicate over a grouping column and wherein the query is transformed

prior to performance of the method steps to return a number of distinct values in the

grouping column', although Bruno specifically teaches query plan with various

predicates for example conjunctive, [see fig 3.1 b], equality join predicates, join

predicates and like [page 9, 3.2.1]. On the other hand, Acharya disclosed query

comprises a GROUP BY predicate over a grouping column and wherein the query is

transformed prior to performance of the method steps to return a number of distinct

values in the grouping column' [col 27, line 36-46, fig 10c].

It would have been obvious to one of the ordinary skill in the art at the time of

applicant's invention to incorporate the teachings of Acharya et al. into automatic

management of statistics on query expressions in relational databases of Bruno

because both Acharya, Bruno directed to optimizing query in relational databases

[see Bruno: chapter 2, page 3, 2.1; Acharya: col 8, line 61-67], both are directed to

query workload [see Bruno: page 20, fig 5.1; Acharya: col 8, line 9-14], and both are

directed to statistics on query [Bruno: page 8; Acharya: Abstract] and are from same

field of endeavor.

One of the ordinary skill in the art at the time of applicant's invention to

incorporate the teachings of Acharya et al. into automatic management of statistics on

query expressions in relational databases of Bruno because that would have allowed

users of Bruno to use GROUP BY predicate to avoid overheads of query optimization

as suggested by Acharya col 27, line 33-35], further allows to add extra column to each

join set relation i.e., query is rewritten to include the extra column group-by-column in

the aggregate operator, thus bringing the advantages of generating high-confidence

error bounds for the approximate answers, and an efficient maintenance technique for

maintaining the statistical summaries in the presence of updates to the database

[Acharya: col 5, line 42-47]

.similarly, Claims 20-21, 42-43 are rejected in the above analysis.

Conclusion

The prior art made of record

    a.   Nicolas Bruno "Automatic management of statistics

on Query expressions in relational database, published on April 25, 2002

    b.   US Patent. No. 6477534

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Srirama Channavajjala whose telephone number is 571-272-4108. The examiner can normally be reached on Monday-Friday from 8:00 AM to 5:30 PM Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alam, Hosain, T, can be reached on (571) 272-3978. The fax phone numbers for the organization where the application or proceeding is assigned is 571-273-8300 Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)

sc
Patent Examiner.
January 20, 2006.   SRIRAMA CHANNAVAJJALA
                      PRIMARY EXAMINER